Design Criteria Manual

Mueller Energy Center II

Austin, Texas
June 1, 2020

HDR Engineering, Inc

TBPE Firm Registration No. F-754

I. Executive Summary

A. Purpose of the Design Criteria Manual

This Mueller Energy Center II (MEC2) Design Criteria Manual (DCM) documents criteria for a new industrial-grade modular chiller plant and thermal storage tank in the Mueller Development in Austin, Texas. The criteria will become part of a contract and serve as the basis for MEC2 but do not preclude other design approaches if a particular criteria does not apply or if, for functional or aesthetic reasons, a different approach should be considered. In such instances, a bidder may present a written request for variance to the Owner's Representative.

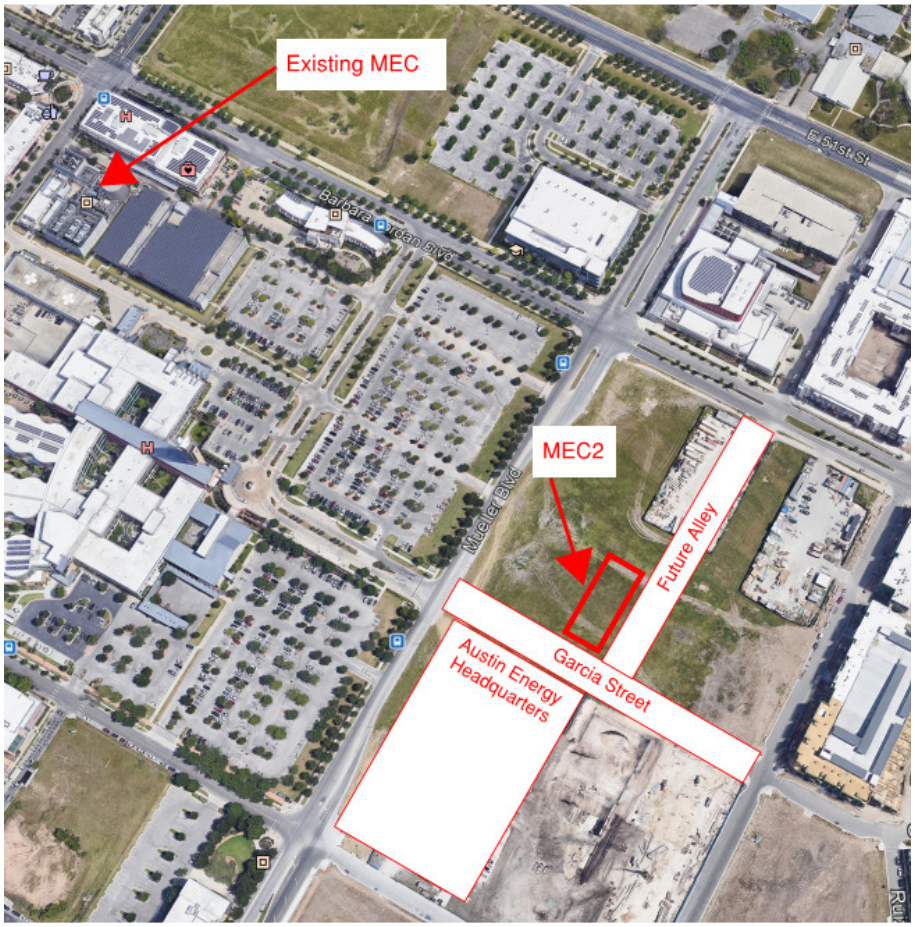

Figure 1-1. Mueller Development Aerial

B. Background and Project Description

The proposed MEC2 will add cooling capacity to the Austin Energy (AE) Mueller distribution system. AE seeks a 6,000-ton industrial-grade modular chilled water plant, associated cooling towers and thermal storage (TES) tank for the site on Garcia Street. MEC2 shall connect to the existing chilled water distribution system located under Garcia Street. The need date is February 2022, subject to negotiation.

C. Concept Collaboration

Representatives from AE will review and approve the proposed MEC2 design. AE has general and operational requirements for the chiller plant but will consider numerous system parameters and preferences including, but not limited to, equipment type and manufacturers, equipment efficiencies, systems and working clearances. AE will have final approval of the equipment layout. Sufficient clearance must be maintained around all equipment for maintenance and future replacement. AE will also have final approval of all equipment selection.

The AE team will assess the proposed design for the plant and associated equipment and make adjustments or provide options, as applicable. Following assessment of bids, the AE team will choose from which contractor to procure the plant, which should include all costs to build, ship, install, connect to utilities, test and commission the plant for chilled water production and delivery on or about February 2022. Time is of the essence for this project.

II. Approval

AE developed this DCM along with the City of Austin Capital Contracting Office and an engineering firm. This document outlines the project scope, schedule and phasing expectations. Any scope changes must be documented via addenda approved by the AE Director of On-Site Energy Resources.

Approved By:

_____
Annette Guerra, Project Manager

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Andrew Gallo, Director - On-Site Energy Resources

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Rich Wilkes, Superintendent

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Ron Coy, Power Systems Engineer, Sr.

III. Design Criteria Manual Contributors

Austin Energy District Energy & Cooling

- Richard Duane
- Andrew Gallo
- Armando Armengol
- Ron Coy
- Robert Burnham

City of Austin Capital Contracting Office

- Leyla Mammadova
- Beverly Mendez

Owner's Engineering Firm

HDR Engineering, Inc. (HDR)

- Brian Perlberg
- Doran McMahon
- Katie Walker

IV. Space/Adjacency Analysis and Requirements

A. Design Strategies

The MEC2 plant design must be industrial-grade and provide operational flexibility, additional chilled water production capacity, optimization for maximum efficiency and work with existing MEC systems and equipment.

The Garcia Street site is well-suited for the plant for several reasons:

- Easy access to 24" chilled water distribution system with existing taps.
- Across from AE's new headquarters building.
- In part of the development approved for large office and mixed use development.
- Close proximity to the existing plant (MEC).

B. Special Requirements

- The Mueller New Construction Council (NCC) must approve all architectural features.
- Close coordination with all impacted parties of interruption of surrounding streets

during equipment deliveries and construction activities, including approved traffic control plan(s).

- Acoustical controls to minimize noise and vibration, which cannot adversely affect surrounding buildings. The plant site shall comply with the City of Austin Noise and Amplified Sound Ordinance which requires noise not exceed 85 db at the property line.

V. Site Analysis

A. Summary Description

The project components include plant (enclosure, chillers, pumps, electric motors, electrical rooms with motor control center and PLC control panel, valves, chemical treatment, refrigerant monitoring with associated purge and make-up ventilation systems, piping, fan coil units for heating/cooling of the space, and controls), cooling towers, right-of-way (ROW) utility connections, electric duct bank, water line, sewer line, storm water line, telecommunication and AE fiber optic and connection to existing chilled water distribution system.

B. Site Development Requirements

1. Utilities

All required utilities are available in the streets bordering the site, including:

- Water
- Sanitary Sewer
- Storm Water
- Electric
- Telecom for telephone and internet.
- AE PLC communications

2. Community Involvement

AE will perform all public and community engagement. The successful bidder may be required to offer planning assistance to AE, providing graphics, project descriptions or technical information.

If necessary, the successful bidder's team representatives may attend and participate in public presentations and assist in follow-up tasks.

3. General Development Considerations

The significant development considerations for the project include the following:

- The plant, cooling towers and associated exterior piping must be located on the site where equipment is least intrusive visibly. The NCC may require screening.
- Prior to shipping the plant, the manufacturer shall test all components using the manufacturer's cooling towers and storage tanks to troubleshoot issues and document plant system capacity and efficiency. AE will provide the program code and may send a representative to witness testing.

- All construction documents must be approved by the Mueller NCC.

C. General Guidelines

1. Operation Efficiency

The operational efficiency of the team is important to the project's success. AE has chosen the "Design-Build" method of procurement. The successful bidder's team should have experience with the design, construction and installing industrial-grade modular plants in an urban environment. The successful team must incorporate these design criteria into the proposed plant and meet all requirements of the city's building permit and general permitting departments for all work. The successful bidder must perform all aspects of the project including, but not limited to: design, construction, permitting, regulatory approvals, traffic control plans and approval from the Mueller NCC.

It would help if the successful team is familiar with the city's right-of-way management department and traffic control requirements.

2. Sustainable Design

The successful team should be familiar with sustainable design practices. The project will not pursue LEED certification however the Mueller Design Book requires Two-Star rating certification under Austin Energy Green Building Program. The project should include sustainable aspects as applicable to the project scope, which may include:

- LED lighting fixtures
- Optimization of plant efficiency
- Use of materials with recycled content
- Reduced construction waste
- Enhanced metering for energy monitoring.

VI. Civil Narrative

A. Project Location

The site is approximately at 4500 Mueller Blvd.

Figure 6-1. Project Location

B. Deeds, Legal Restrictions and/or Lease Agreements

The site is located in Block 3 Lots 1 and 2 of the Mueller Section 1B-2 Subdivision and flanked by the remainder of Lot 1 to the North and West and Lot 2 to the North and East. The 120 foot right of way (ROW) of Garcia Street is to the south. AE will perform any replat or plat amendment, as appropriate.

C. Mueller Design Book (MDB)

The proposed project must comply with the MDB.

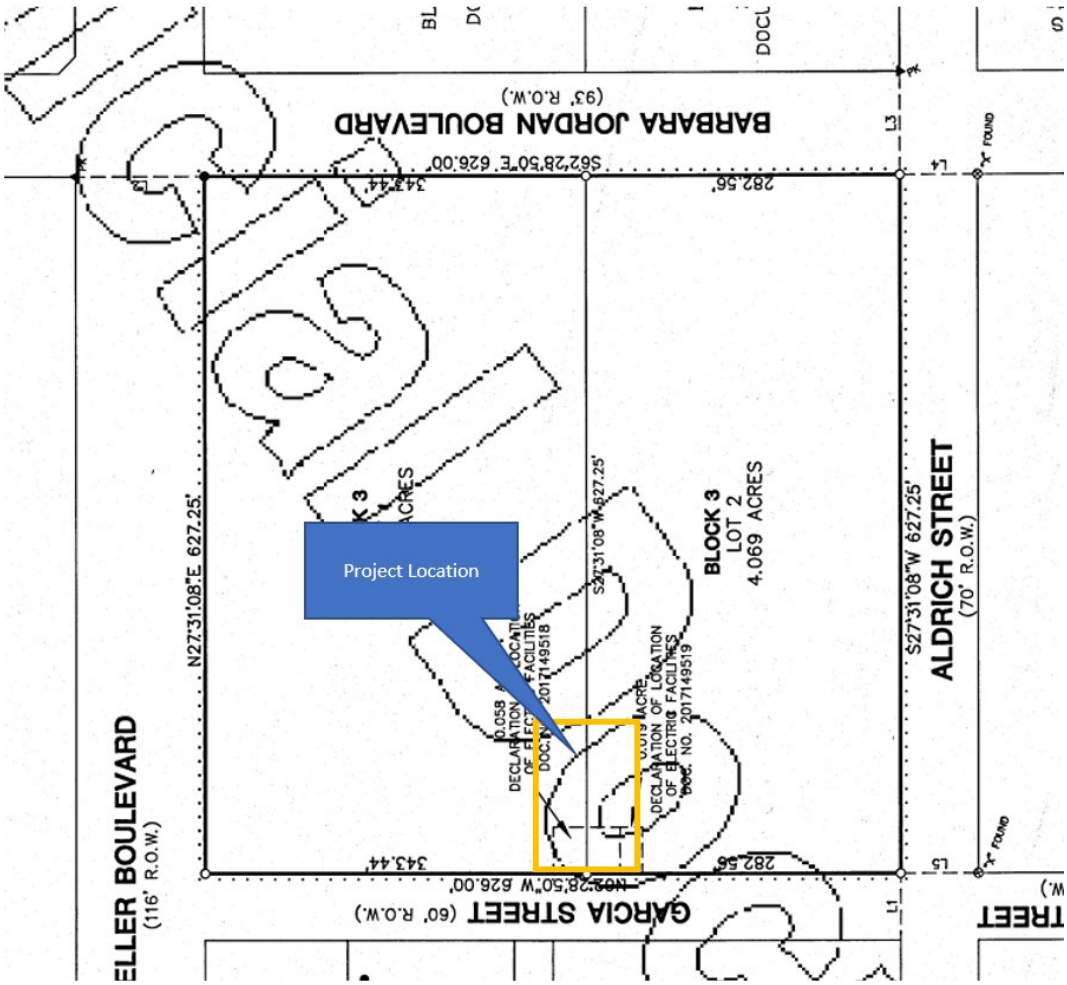


Figure 6-2. Plat of Project Location

D. Topography and Vegetation

Based on the 2017 Topography available from the City of Austin, the site is flat, with elevations ranging between 624' and 621'.

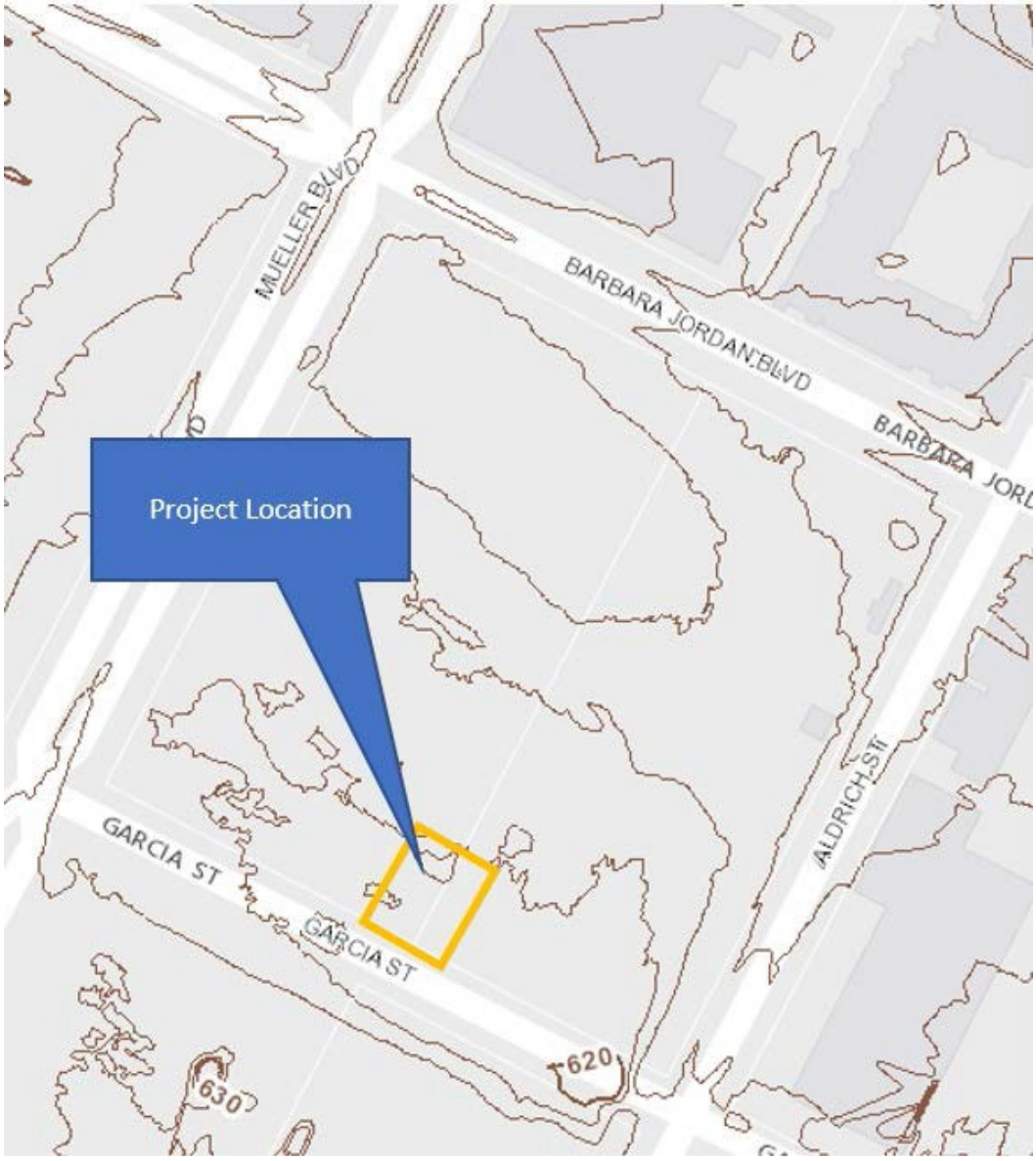


Figure 6-3. Project Area Topography

According to the City of Austin data the site does not contribute to the existing tree canopy areas. As shown in Figure 6.4, no trees exist within the project area.

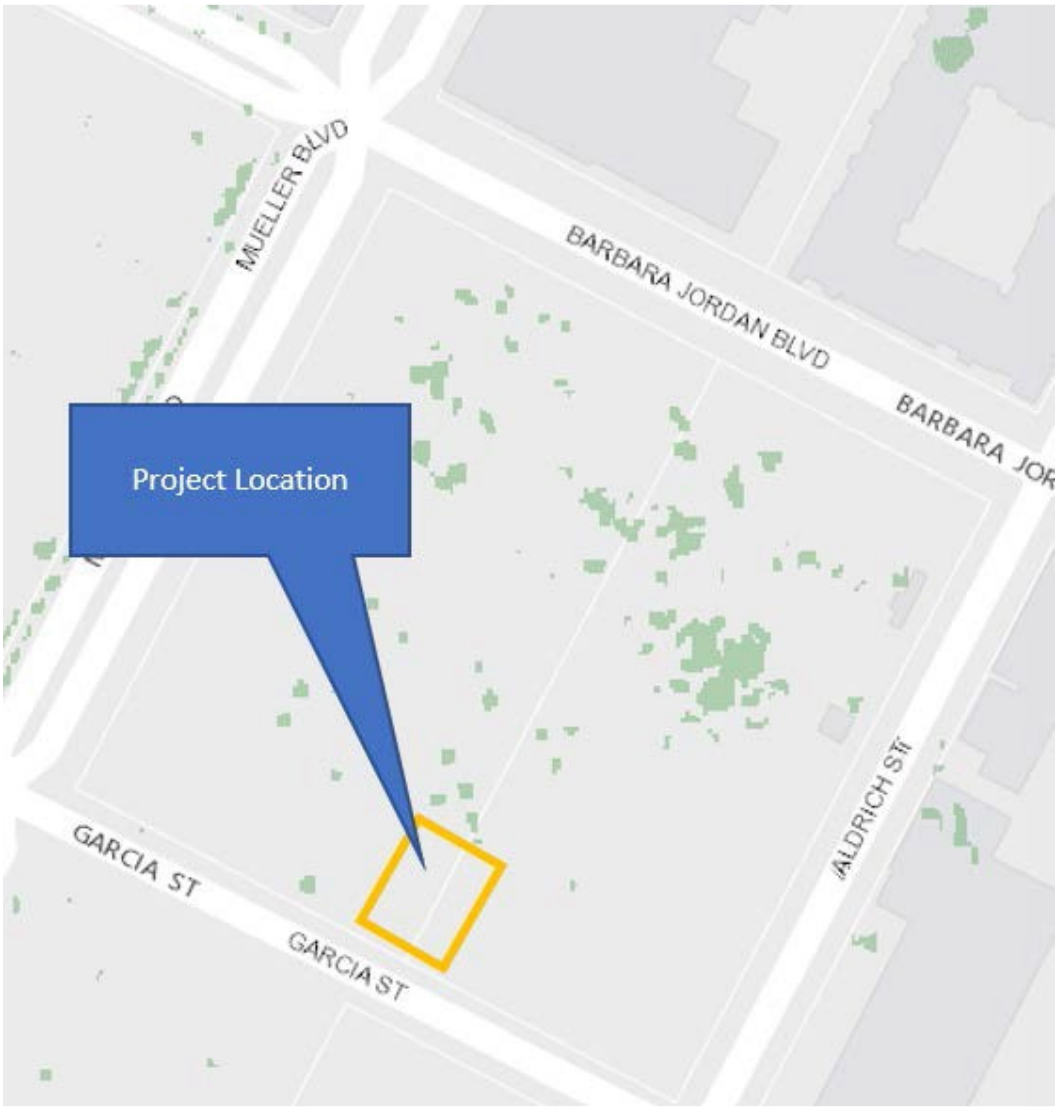


Figure 6-4. Vegetation/Tree Canopy

E. Environmental Considerations

No portion of the site is in the Special Flood Hazard Area (SFHA) according to FEMA Panel 48453C0465J effective 1/6/2016. According to FEMA, the site is outside the 500-year flood plain. The site lies within the Boggy Creek watershed and has been designated by the City of Austin as an Urban Watershed.

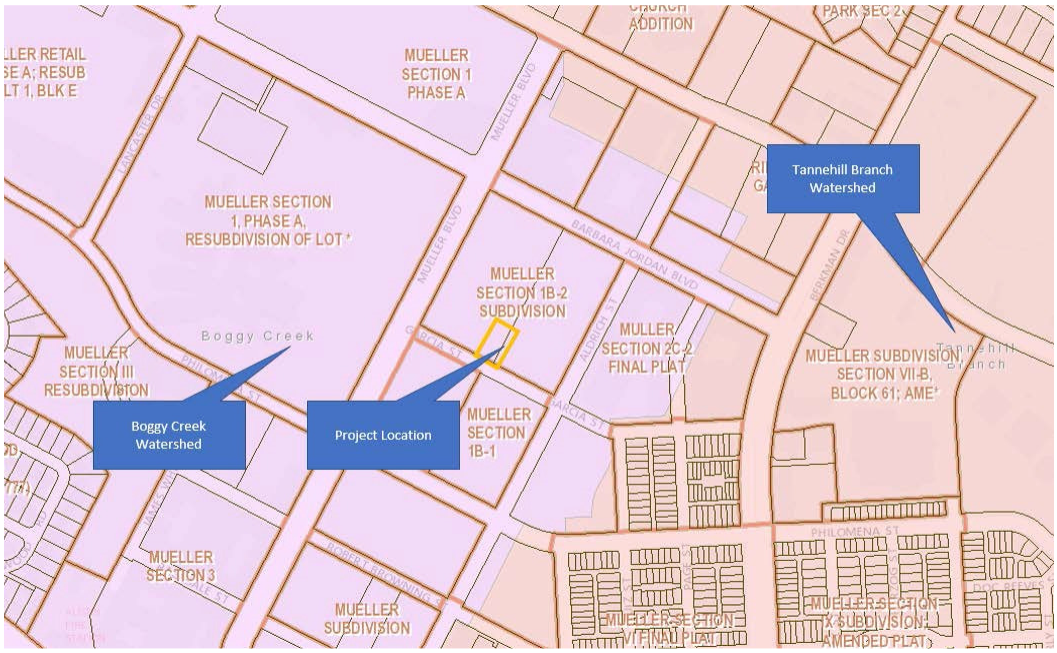


Figure 6-5. Project Area Watershed

There are no Creek Buffers or Waterway Setbacks on the property and the site is not within the Edward Aquifer Recharge Zone, Recharge Verification Zone or Contributing Zone. The site in not encumbered by an erosion hazard zone review buffer. There are no known underground storage tanks, springs, wetlands, rock outcrops, grasslands, or other biological resource buffers on the site.

F. Zoning and Land Use Considerations

The site is zoned as PUD and the land use is MR-1. AE has obtained a determination the plant constitutes a local utility and is a permissible land use in this zoning district.

G. Utilities and Infrastructure

1. Water

The site has access to a 12-inch PVC water line located along the northern ROW of Garcia Street.

Figure 6-6. Project Area Water Infrastructure

2. Sanitary Sewer

The site currently has access to an eight-inch PVC wastewater line along the northern ROW of Garcia Street.

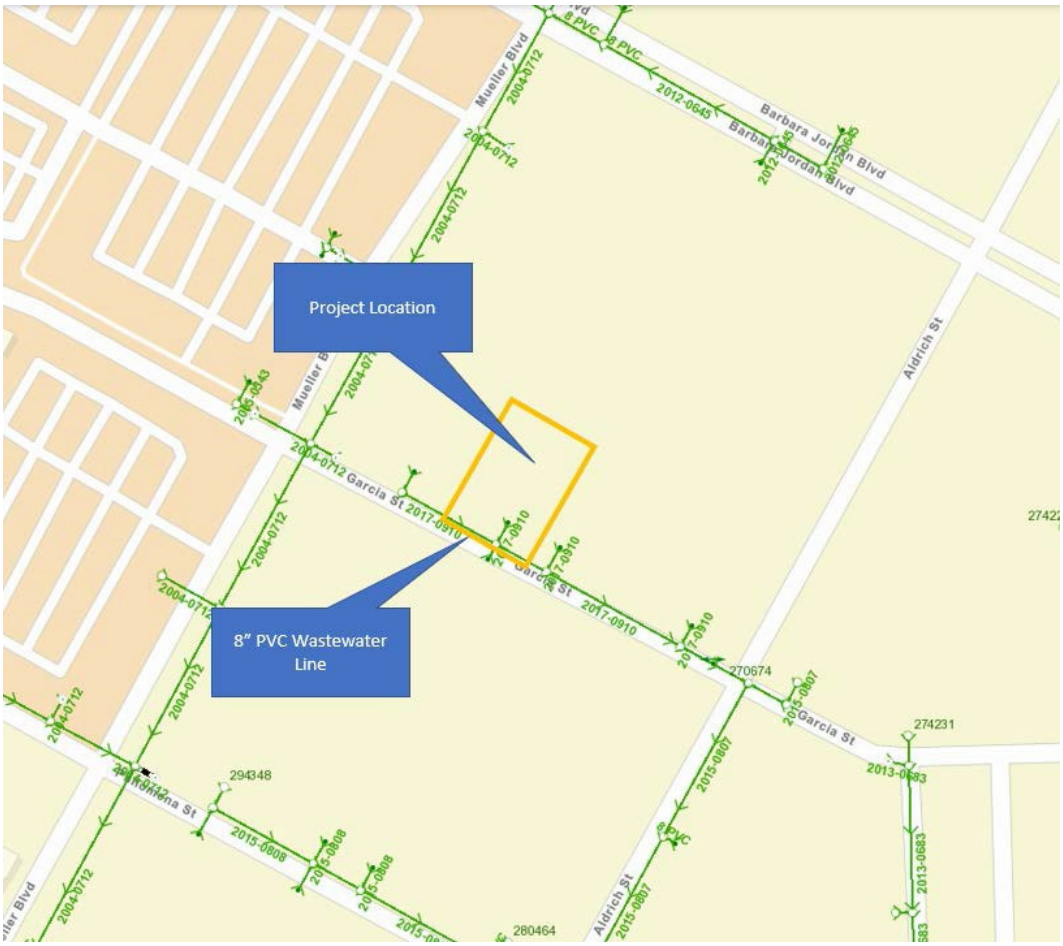


Figure 6-7. Project Area Wastewater Infrastructure

3. Drainage and Water Quality

There is no development currently on the site and existing impervious cover is zero.

City of Austin regulations require storm water controls to reduce non-point source pollution from developing sites and provide flood control by mitigating increases in storm water discharge rates due to increased impervious cover.

The project calls for a footprint of 10,584 square feet for the plant, tank, switch gear and driveway. The design for the remainder of the site should minimize regular yard maintenance.

AE estimates water quality features would occupy 1,000 square feet of the site; however, the site owner can connect to a regional water quality pond. Permeable pavement may be used in pedestrian areas to reduce the impervious cover and reduce the square footage required for water quality features.

The site owner has the ability to connect to the storm water conveyance system in Garcia Street requiring construction of the site and ROW improvements necessary to connect to the infrastructure feeding into the existing regional ponds per Figure 6.8 Project Area Pond and Piping Locations.

Figure 6-8. Project Area Pond and Piping Locations

VII. Landscape Narrative

Landscape requirements for development in Mueller are identified in the City of Austin Land Development Code, City of Austin Environmental Criteria Manual, Mueller Planned Unit Development and the MDB. The Land Development Code (LDC) identifies requirements to comply with current city ordinances.

The Environmental Criteria Manual address the guidelines and design criteria presented in the LDC. The Mueller Planned Unit Development (MPUD) identifies specific exemptions and alterations to the LDC's requirements. The MDB requirements are additional to the LDC and the ECM. **Attachment A** (Streetscape Obligations) contains specific requirements provided to Austin Energy for the project site.

VIII. Architectural Narrative

A. Applicable Codes, etc.

- 2015 International Building Code and Local Amendments
- 2015 International Energy Code and Local Amendments
- 2015 International Fire Code and Local Amendments
- 2015 International Residential Code (IRC) and Local Amendments
- 2015 International Property Maintenance Code (PMC) - Local Amendments 2015 Uniform Mechanical Code (UMC) and Local Amendments
- 2015 Uniform Plumbing Code (UPC) and Local Amendments
- 2017 National Electrical Code and Local Amendments
- MDB (Reference PUD zoning ordinance)

B. Building

Construction type is assumed to be Type II or Type III: A or B. Some or all of the site may be secured behind a façade.

Description: CHILLED WATER PLANT

U – UTILITY AND MISCELLANEOUS GROUP U

ALLOWABLE HEIGHT

TYPE II: A (65); B (55)

TYPE III: A (65); B (55)

ALLOWABLE NUMBER OF STORIES

TYPE II: A (5); B (3)

TYPE III: A (4); B (3)

ALLOWABLE AREA

TYPE II: A (57,000); B (25,500)

TYPE III: A (42,000); B (25,500)

C. Major Design Considerations (NCC)

Note: Reference Appendices to MDB.

- The site must be secured. Traditional fencing over 72" tall in general is not allowed by the Mueller Design Book adjacent to the street and is unlikely to be approved unless the security measures are designed to have aesthetic continuity with the building façade. The site's secured perimeter must provide truck entry for maintenance and operations.
- The building may contain minimal windows (NCC may require coordination of their location).
- The NCC may require equipment screening. Any screening must allow for proper air flow.
- A Thermal Energy Storage (TES) tank must serve the plant and provide at least 10,000 ton-hours of TES. The NCC must approve the design/location of the tank.
- The plant must have sufficient entrance points to allow for maintenance, repair and replacement of equipment, which must include overhead doors.
- The successful team must confirm type and quantity of entrance points for coordination and integration with façade concept if used.

D. Site Considerations

Placement of the building is desired to be as close to the property line as possible to maximize use of the site.

The site is 102 feet wide along Garcia Street and 152 feet deep along future alley. The following setbacks apply to the site:

- Property line on Garcia Street (south property line) – 3 feet.
- Property line of future alley (east property line) – 3 feet back from the alley easement plus 25 feet for half of the alley easement.
- The interior property lines (west and north property lines) – can be zero setback, dependent upon building code, and the fire rating of the proposed walls of the structure.
- The resulting buildable area is 74 feet by 149 feet.

IX. Structural Narrative

A. Codes and Standards

The following codes and standards apply to the structural design of the project:

- International Building Code (IBC), Edition adopted by City of Austin at design commencement.
- American Society of Civil Engineers (ASCE) ASCE/SEI 7-10, Minimum Design Loads for Buildings and Other Structures.
- American Concrete Institute (ACI) 318, Building Code Requirements for Structural Concrete.
- American Institute of Steel Construction (AISC) Specification for Structural Steel Buildings, AISC 360-16
- Concrete Masonry: Building Code Requirements for Concrete Masonry Structures, American Concrete Institute, (ACI) 530/530.1-13

B. Design Loads

Plant loading will consist primarily of the weight of mechanical and electrical equipment and distribution piping. The plant should be designed for loads as dead loads in known locations. Areas between the equipment should be designed for the live loads.

X. Mechanical Narrative

- Applicable Codes and Standards include but are not limited to:
- ASHRAE 90.1-2019 – Energy Standard for Building, Except Low-Rise Residential Buildings 2016.
- ASHRAE 15-2019 – Safety Standard for Refrigeration Systems and Designation and Classification of Refrigerants 2016.
- 2015 International Building Code (IBC) with COA Local Amendments (http://library.municode.com/tx/austin/codes/land_development_code?nodeId=TIT25LADE_CH25-12TECO_ART1BUCO).
- 2015 International Energy Conservation Code (IECC) with COA Local Amendments (https://library.municode.com/tx/austin/codes/land_development_code?nodeId=TIT25LADE_CH25-12TECO_ART12ENCO).
- International Association of Plumbing and Mechanical Officials (IAPMO) 2015 Uniform Mechanical Code (UMC) with COA Local Amendments (https://library.municode.com/tx/austin/codes/land_development_code?nodeId=TIT25LADE_CH25-12TECO_ART5MECO).
- 2015 Uniform Plumbing Code (UPC) with COA Local Amendments (https://library.municode.com/tx/austin/codes/land_development_code?nodeId=TIT25LADE_CH25-12TECO_ART6PLCO).
- 2017 National Electric Code (NEC) with COA Local Amendments (http://library.municode.com/tx/austin/codes/land_development_code?nodeId=TIT25LADE_CH25-12TECO_ART4ELCO).

A. Concept

Provide a 6,000 ton industrial-grade chilled water central utility plant with 10,000 gross ton-

hours of TES connected to the existing local chilled water distribution system and designed to work in conjunction with the existing plant currently serving the Mueller District.

Provide a complete industrial-grade chilled water central utility plant on the subject property. The plant must have adequate clearances for servicing all equipment.

1. Modular Plant Requirements

Modular plant options must be a factory assembled, fully enclosed, walk-in modular chiller plant. The plant must consist of enclosure, chillers, cooling towers, chilled water side stream separator/pump, packaged rooftop unit/chilled water fan coil unit for heating/cooling of the building, electrical components, controls, dry room motor control center, valves, chemical treatment, refrigerant monitoring with associated purge and make-up ventilation systems, and all necessary piping and components for a complete functioning system. The plant must have separate dedicated areas for electrical and chemical treatment.

2. Chilled Water Production Equipment

Chillers shall be factory-assembled, packaged and tested centrifugal type chillers, refrigerant metering device, lubrication system, prewired control panel with user interface and a refrigerant purge system.

Plant must be designed for 40℉ leaving chilled water and 56℉ entering chilled water and may operate at either 480V or 4,160V based on final plant configuration.

Sufficient cooling towers shall be provided and designed for 79.8℉ wet bulb temperature.

Cooling tower location, sizing, and screening shall consider the cooling tower plume impact on surrounding buildings/structures.

3. Pumping Systems

All pumping systems to be constructed in a configuration to facilitate an N+1 redundancy operating sequence; *i.e.* the configuration must allow continued, uninterrupted service despite the loss of a single system component.

Chilled water pumps must be configured in a primary-secondary configuration with N+1 redundancy.

Condenser water pumps must be configured in an N+1 redundancy configuration.

The pumping system must work in conjunction with the existing MEC plant and Mueller District chilled water distribution system.

4. Thermal Storage System

A steel TES tank not to exceed 65’ above finished grade must be provided on the site, separate from the plant and provide a minimum of 10,000 gross ton-hours of chilled water capacity. The TES shall be used during AE’s on-peak hours for energy demand and energy usage. During on-peak hours, the chillers and primary chilled water pumps will be shut down and chilled water will be drawn from the TES tank and distributed to the loads by the secondary chilled water pumps. During off-peak hours, the chillers and primary chilled water pumps must have the ability to meet the Mueller District’s cooling load ***and*** recharge the TES tank.

5. Vibration and Sound Control

New chillers, cooling towers, pumps, in-line fans and heating/cooling units must be designed to minimize vibration and sound. The plant site shall comply with the City of Austin Noise and Amplified Sound Ordinance which requires that noise cannot exceed 85 db at the property line.

6. Piping and Valve Requirements

All hydronic system piping shall be the responsibility of the successful bidder, including chilled water piping, condenser water piping, makeup water, sanitary, TES connections, control wiring and electrical wiring.

All chillers and chilled and condenser water piping shall be industrial grade.

Primary chilled water and condenser water piping shall be sized for a maximum velocity of 10 fps. Secondary chilled water piping shall be sized for a maximum velocity of 7 fps or less.

Chilled water and condenser water pipe insulation must prevent condensation. AE prefers one-inch thick insulation for indoor piping of one-inch and smaller and two-inch thick insulation for indoor piping larger than one-inch.

AE prefers the following insulation for outdoor piping or piping in unconditioned spaces:

- 1” and smaller = 2” thick insulation
- Larger than 1” = 2” thick insulation.
- Piping exposed to exterior conditions should have aluminum jackets; otherwise piping should have PVC jackets.
- Freeze protection shall be provided on all exterior piping and instrumentation.

All piping to be labeled with service and direction of flow.

Prior to placing pipe in service the following activities must occur:

- Hydrostatic testing of the chilled water pipes
- Thorough cleaning and flushing of chilled water pipes
- Passivation of chilled water pipes (chillers and cooling towers need not be passivated).

B. Instrumentation & Control System (ICS) Requirements

The plant must be controlled and monitored by new industrial process automation controls designed using Allen Bradley automation controllers that integrate with AE’s existing control system. The ICS shall be designed to include the enterprise level portion, plant control portion and unit control portion.

The enterprise level portion shall be the Human Machine Interface (HMI) to the entire ICS and include all required elements to cause the existence of the full proper functioning of the ICS and its integration with AE’s existing Allen Bradley system. The enterprise level equipment, software and programming including all HMI work shall be provided by AE.

The plant control portion shall be based on Balance of Plant (BOP) PACs connected at the

highest system. The BOP shall report up to the enterprise level and communicate to the unit control level. The BOP shall be equipped with all the controls, drivers, and communications gateways to communicate with the unit control portion of the system. The BOP shall communicate with all plant drives using Ethernet/IP and powered using an uninterruptable power supply (UPS).

The unit control portion shall be defined as the chiller control portion. The Chiller design shall allow the chiller PAC to be Allen Bradley or another type PAC or Direct Digital Control (DDC) controller chosen by the chiller manufacturer. The chiller PAC shall be equipped with dual Ethernet bridge and communicate to the BOP using Ethernet/IP protocol. If the chiller is controlled using a DDC controller, the chiller shall communicate to the BOP using BACnet/IP protocol. All chiller loops checkout shall be performed by the chiller and modular plant manufacturer technicians under observation by AE.

The chiller unit control software shall remain the property of the chiller manufacturer and the chiller manufacturer shall provide full service, upgrades and warranty for the software for twenty years.

The chiller manufacturer shall provide all work for its side of the communication up to the BOP and HMI causing the proper reading and writing of variables, setpoint adjustments, retrieving alarms, receiving all internal variables in the chiller and associated equipment.

Bidders must provide documents as part of the construction bid clearly presenting the actual ICS design submittal required for the ICS contractor (ICSC). The ICSC must provide the required ICS design, produced using the latest AutoCAD version, in paper format and on a CD in editable format and not locked.

The ICS design documents shall be created with the level of detailed information to provide enforceable action to the ICSC to cause it to provide to AE an ICS submittal presenting the correct level of detail to allow AE to fully comprehend the installation completely, thereby allowing AE to operate, modify and add to the new plant in the future.

The ICS design documents for this project shall include point-to-point wiring diagrams showing conduit tags, cable tags, conductor tags, conductor colors, equipment tags, panel tags, item tags, terminal strip tags, and terminal tags as marked on OEM devices, panel terminal tags, as minimum, the following items:

1. ICS Drawing List & General Notes SHEET.
2. ICS Drawings Symbols & Abbreviations SHEETS.
3. ICS information table SHEETS presenting DLR number and all associated information on all Input / Output Points.
4. ICS network architecture SHEETS presenting enterprise level control and plant level control components. Points.
5. ICS floor plans SHEETS presenting locations of ICS components with tagging using methods and SHEET location grid as described in Item 2.
6. ICS P&ID SHEETS presenting ICS components with tagging using methods and SHEET location grid as described in Item 2.
7. ICS Chiller I /O and Chiller VSD I/O SHEETS presenting required I /O to be monitored and reported.
8. ICS P&ID SHEETS presenting chemical treatment systems and ICS components with tagging using methods and SHEET location grid as described in Item 2 above.

9. ICS P&ID SHEETS presenting refrigerant leak detection systems and emergency power off systems and ICS components with tagging using methods and SHEET location grid as described in Item 2 above.
10. ICS P&ID SHEETS showing common systems and ICS components with tagging using methods and SHEET location grid as described in Item 2 above.
11. ICS PAC panel SHEETS presenting ICS components with tagging using methods as called out.
12. ICS PAC panel BOM SHEETS presenting ICS components with tagging using methods as called out.
13. ICS PAC panel power infrastructure wiring presenting ICS components with tagging using methods as called out.
14. ICS valves and flow meter schedules showing components with tagging using methods as called out.
15. ICS P&ID LOOP SHEETS presenting common systems and ICS components with tagging using methods and SHEET location grid as described in Item 2 above.
16. ICS P&ID Installation Detail SHEETS presenting components with tagging using methods as called out.

C. Plumbing Narrative

Applicable codes and standards include, but are not limited to those set forth in Sections VIII, IX, and X, above.

Domestic cold water must be brought on-site and a new city water meter set by Austin Water Utility. Redundant backflow preventers with a single water meter must be provided for make-up water to the chilled and condenser water systems. Where auxiliary water is used on-site, backflow preventers must be installed immediately downstream of the city water meter per Austin Water Utility standards. A separate make-up water meter must be provided and monitored by the plant control system. The make-up water meter shall be a type approved by Austin Water Utility for the evaporation credit program.

The public sewer must be extended on-site to a point five feet outside the property. Soil and vent piping shall be designed to accommodate the new equipment and architectural layout and the building drain shall convey waste to the building sewer. The building sewer will tie into the public sewer five feet outside the property. All blow-down piping must be metered and monitored by the plant control system.

Below-grade sanitary sewer piping and above-ground soil and vent piping shall comply with applicable codes.

XI. Fire Protection Narrative

Applicable codes and standards include, but are not limited to the International Fire Code 2015 – Local Amendments.

The fire sprinkler system must be monitored by the plant-wide control system and the fire alarm system. Provide an automatic wet pipe sprinkler system in accordance with NFPA

The successful bidder will determine the location and arrangement of components such as

indicating control valves, system riser components, water flow alarms, *etc*.

XII. Electrical Narrative

Applicable Codes and Standards include but are not limited to:

- NFPA 70 – National Electric Code (2017) and Local Amendments
- Current version of the AE Design Criteria (https://library.municode.com/tx/austin/codes/utilities_criteria_manual?nodeId=S1AUENDECR)
- NFPA 101 – Life Safety Code (2015)
- 2015 International Building Code and Local Amendments

A. Electrical Systems

AE Electric Service Delivery (ESD) has either primary service (12.47kV) or secondary service (480V) available at the site. ESD will provide dual feeds to the site and the automatic throw over (ATO) equipment. The successful bidder will be responsible for coordinating all ESD equipment pads and manholes.

A preliminary load analysis indicates a load of approximately 8MVA.

Primary Service Option

For primary service, the project will include metering enclosures for potential transformers (PTs), current transformers (CTs) and Ion Meters separate from the plant MV switchgear. The mains and feeder breakers will each have power metering and be networked to the plant-wide control system.

Feeders must be routed to chillers and unit substations.

Secondary Service Option

For 480V secondary service to the plant, ESD will provide multiple utility transformers. The successful bidder shall provide multiple 480V electrical services to exterior main disconnect switches. The main disconnect switches will feed the plant.

Balance of Plant Equipment

480V low voltage motor control centers (MCC) will contain equipment starters, variable frequency drives and circuit breakers. MCCs shall be double-ended with feeder circuits from separate services. The MCCs shall contain metering for each cubicle of the MCC and be networked to the plant-wide control system.

Dry-type 480-120/208V transformers and panel boards will be used to serve various balance of plant loads such as general purpose receptacles, control panels, and other equipment requiring electrical connections. Surge protection will be provided at each level of distribution voltage.

All systems will be designed in accordance with the National Electrical Code (NEC). Raceways will consist of conduit and cable tray. All raceways and cable trays will be color coded to identify the installed system.

B. Documentation

Complete electrical studies and drawings are required for permitting as well as record documents for AE. The documents shall include, at a minimum:

- Power system coordination, fault, load flow, and arc flash studies. A preliminary fault study is required prior to purchasing any electrical gear in order to verify the proposed gear has adequate ampere interrupting capacity (AIC) and withstand ratings for its intended installation location.
- Site power and lighting plans
- Modular plant power and lighting plans
- Modular plant control system plans
- Electrical plans to all equipment connections
- Panel schedules
- Cable and conduit schedules
- One-line diagrams
- Switchgear, motor control center, switchboard and other major equipment elevations
- Arc fault labels for all equipment

XIII. Telecommunications Narrative

The project shall include a dedicated fiber optic connection for PLC communications from the existing MEC to the plant, routed through a combination of existing and new conduit. A separate communication connection must be provided for telephone and internet cables.

XIV. Fire Alarm

The plant shall have a fire alarm system complying with applicable codes and monitored by a fire monitoring service and the plant-wide control system.

XV. Permitting

All requirements for City of Austin (COA) construction activities apply. Per the Land Development Code, a site development plan and permit are required for the site per the Mueller PUD. Project is also subject to review and approval by the Mueller NCC in a stipulated sequence of approvals. Each approval is contingent upon, and must be consistent with, prior approvals.

All ROW plans must be submitted for approval. All inspections, reviews, fees, testing, and permits required for design and construction for this project are the responsibility of the successful bidder. Where the project includes work to be owned, operated, and maintained by the COA, transfer of responsibility shall be by means of a document setting forth the facilities and conditions of acceptance.

Any variances must be approved by COA Development Review and Inspection Department.

XVI. Presentations

The successful bidder will be responsible for preparing presentation materials and supporting documents for the NCC and other boards or community groups, as needed. The presentations will be jointly performed with AE.

XVII. Roles and Responsibilities

Detailed Design & Construction Phasing/Planning

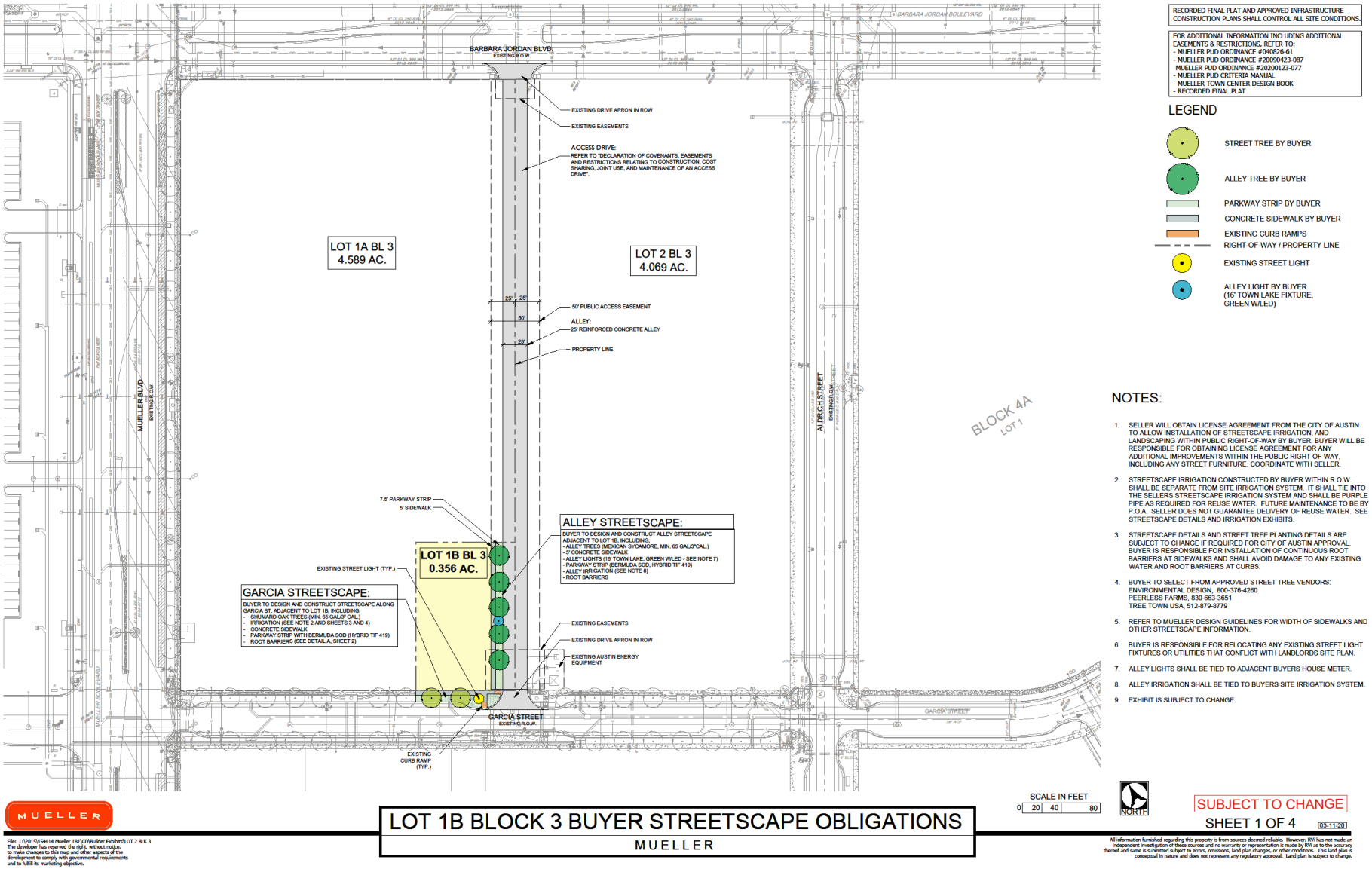
In addition to industry standard construction documents, the following specific items should be included:

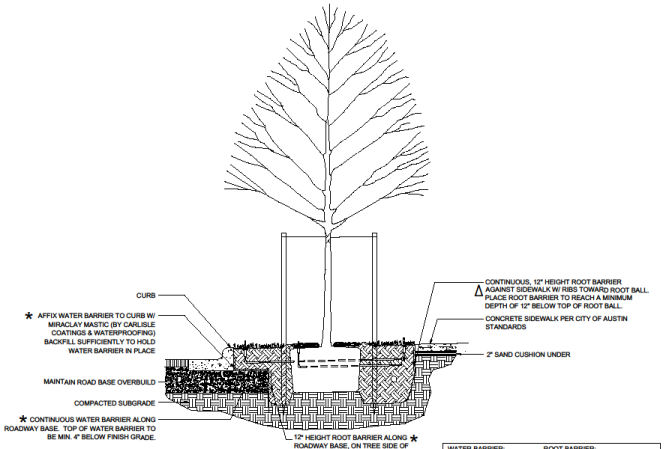
- Assessment of the concept design criteria.
- Creation of an equipment package to procure the modular plant.
- Development of stand-alone civil construction documents and traffic control plans for any work in the ROW.
- Development of construction documents for the architectural, civil, structural, mechanical, controls, electrical, plumbing, telecommunication, security, fire alarm, and fire protection work.
- Coordination with AE ESD for choice of electric service and layout of equipment.
- Acoustical control equipment to minimize noise and vibration. The noise and vibration cannot adversely affect the surrounding businesses and residents.
- Construction documents must address crane location, delivery and staging areas, and vehicle travel approaches to the site.
- Obtaining all applicable permits from the city.

In addition to industry standard construction practices, the following specific items should be included:

- A detailed schedule for delivery of equipment to coordinate with surrounding projects.
- Identify off-site parking for construction personnel and a method of transportation to the site.
- Implement a noise and vibration mitigation practice to minimize construction noise during events

Attachment A - Streetscape Obligations





WATER BARRIER:	ROOT BARRIER:
AT CURB: CCW MIRACLAY (BENTONITE CLAY WATERPROOFING SYSTEM) BY CARLISLE COATINGS & WATERPROOFING WWW.CARLISLE-CCW.COM TEL: 800.527.7992	AT SIDEWALK & ROAD BASE VERBUILD: ROOT BARRIER, UB 12-2 (12" HEIGHT PANEL DIMENSION) AT AUSTIN WATER UTILITY INFRASTRUCTURE LESS THAN 8 FEET FROM TREE: ROOT BARRIER, UB 48-2 (48" HEIGHT PANEL DIMENSION) BY DEEP ROOT PARTNERS, L.P. 530 WASHINGTON ST SAN FRANCISCO, CA 94111 TEL: 800.458.7668

BUYER'S ROOT BARRIER NOTES:

AUSTIN WATER UTILITY (AWU)

1. TREES SHALL BE LOCATED A MINIMUM OF 5' HORIZONTAL FEET FROM ALL AWU INFRASTRUCTURE. (WATER LINES, WASTEWATER LINES, FIRE HYDRANTS, WATER METERS, ETC.)
2. TREES WITHIN 5' TO 8' FEET OF ANY AWU INFRASTRUCTURE REQUIRE A 48" HEIGHT PLASTIC ROOT BARRIER TO BE INSTALLED PARALLEL TO THE UTILITY LINES(S) AND/OR APPURTENANCES PER THE STANDARD DETAIL FOR "DEEP ROOT TM" ROOT BARRIER.

STORMWATER INFRASTRUCTURE

1. TREES SHALL BE A MINIMUM OF 10' FROM STORM INLETS AND INFRASTRUCTURE.

✱ EXISTING ROOT AND WATER BARRIERS ALONG CURBS OF LOT.
Δ BUYER RESPONSIBILITY. SEE ALSO "BUYER'S ROOT BARRIER NOTES"

Ⓐ TREE IN PARKWAY STRIP - SECTION

N.T.S.

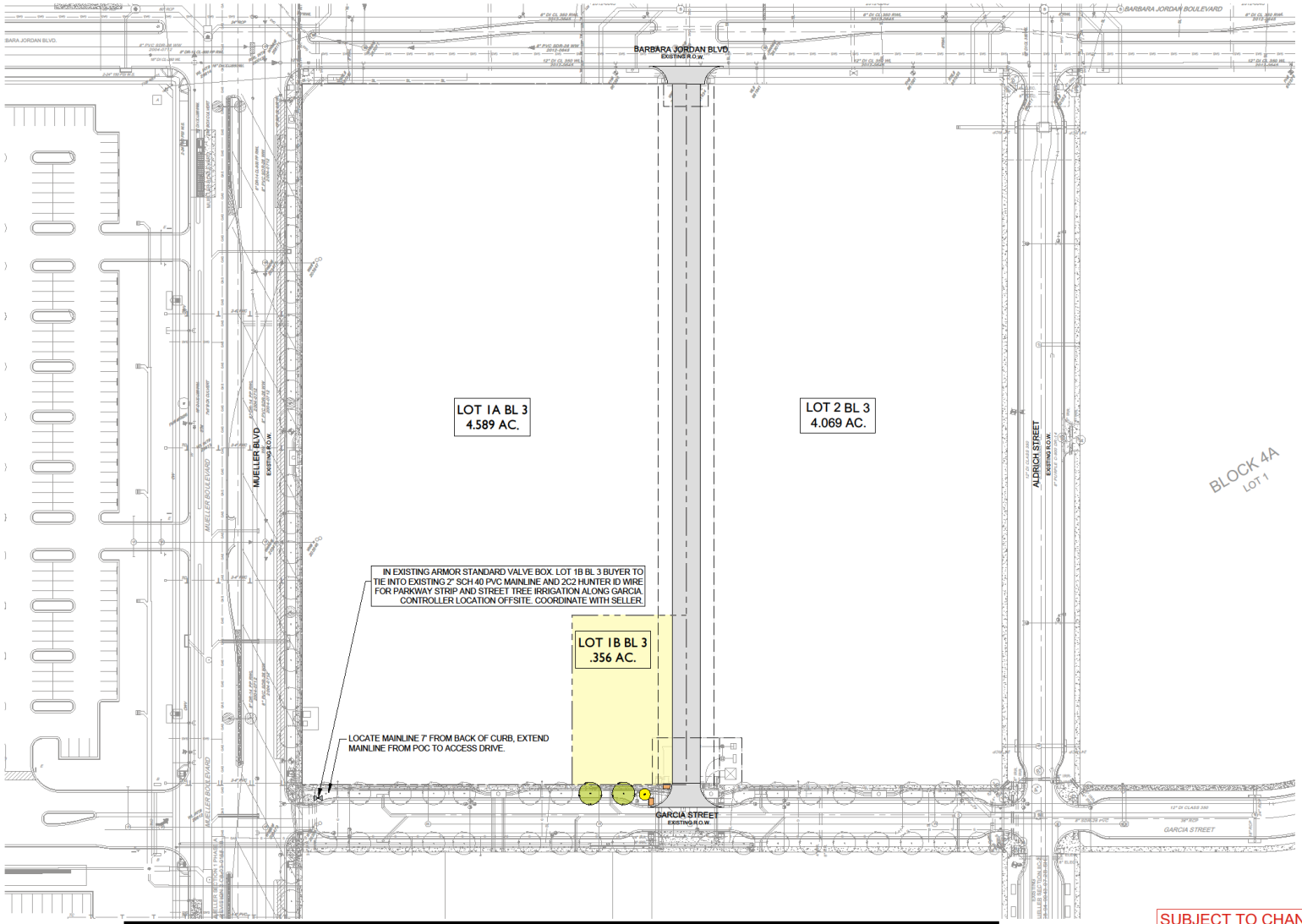
MUELLER

LOT 1B BLOCK 3 BUYER STREETSCAPE OBLIGATIONS

MUELLER

SUBJECT TO CHANGE

SHEET 2 OF 4 03-11-20



MUELLER

LOT 1B BLOCK 3 BUYER STREETSCAPE OBLIGATIONS - IRRIGATION

MUELLER

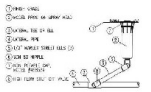
SUBJECT TO CHANGE

SHEET 3 OF 4

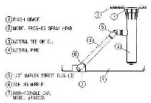
03-11-20

File: L:\2015\154414 Mueller 1B1\CD\Builder Exhibits\LOT 2 BL 3
The developer has reserved the right, without notice,
to make changes to this map and other aspects of the
development to comply with governmental requirements
and to fulfill its marketing objective.

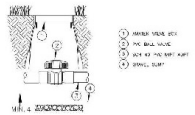
All information furnished regarding this property is from sources deemed reliable. However, RVI has not made an independent investigation of these sources and no warranty or representation is made by RVI as to the accuracy thereof and same is submitted subject to errors, omissions, land plan changes, or other conditions. This land plan is conceptual in nature and does not represent any regulatory approval. Land plan is subject to change.



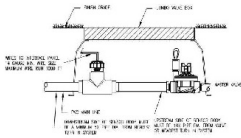
1 PROS-04 SPRAY HEAD



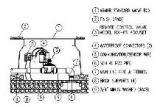
2 PROS-06 SPRAY HEAD



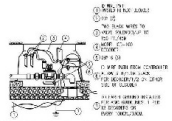
3 SPEARS PVC BALL VALVE



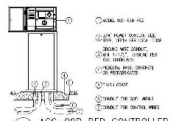
4 FLOW-CLIK_W/ VALVE



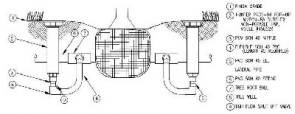
5 ICV FILTER SENTRY VALVE



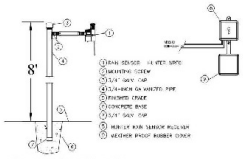
6 ICD 100 DECODER



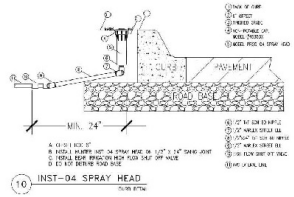
7 ACC-99D PED CONTROLLER



8B PROS-04 TREE BUBBLER



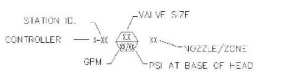
9 RAIN/FREEZE-CLIK



10 INST-04 SPRAY HEAD

LEGEND

- HUNTER PROS-04 4'/15' RADIUS NOZZLE
- HUNTER PROS-04 4'/12' RADIUS NOZZLE
- HUNTER PROS-06 4'/10' RADIUS NOZZLE
- HUNTER PROS-06 4'/8' RADIUS NOZZLE
- HUNTER PROS-06 4'/5' RADIUS NOZZLE
- HUNTER PROS-04 4'/PCN-10 BUBBLER NOZZLE
- HUNTER PROS-06 4'/STRIP NOZZLE
- HUNTER PROS-04 4'/17A ADJUSTABLE ARC NOZZLE
- HUNTER HFS FLOW SENSOR w/PGT-300 TEE
- HUNTER ICV-151 AS ELECTRIC VALVE
- SPEARS SCH 40 PVC BALL VALVE
- HUNTER WITC FREEZE AND RAIN SENSOR
- HUNTER CONTROLLER (one)
- BACKFLOW DEVICE (one)
- SCH 40 PVC MAIN LINE
- CLASS 200 PVC LATERAL LINE
- EXISTING DOUBLE SLEEVES: 3"-4" & 1-4" SLEEVE NON POTABLE WATER PRESSURE LINES 6' ON CENTER WHEN PASSING OVER OR UNDER POTABLE WATER LINES
- TO BE INSTALLED UNMARKED SLEEVE SIZING:
  - 1" PVC PIPE – 2" PVC SLEEVE
  - 1" PVC PIPE – 2" PVC SLEEVE
  - 1" PVC PIPE – 2" PVC SLEEVE
  - 1-1/4" PVC PIPE 2" PVC SLEEVE
  - 1-1/2" PVC PIPE 3" PVC SLEEVE
  - 2" PVC PIPE – 4" PVC SLEEVE
  - 2-1/2 PVC PIPE – 4" PVC SLEEVE
  - 3" PVC PIPE – 6" PVC SLEEVE
  - SLEEVE HUNTER Refer to SEPARATE PVC SLEEVE



EFFECTIVE WATER MANAGEMENT L.L.C.
Irrigation Design and Consultant
21507 Hyrwood
San Antonio, TX 78258
ofc: 210 481 1258
cell: 210 213 3602
email: ewm@satx.rr.com

NORTH

20 0 10 20 40

IRRIGATION NOTES – 1

A. The **Buyer** shall be responsible for the irrigation of all required landscape areas and plant materials, utilizing one or a combination of the following methods:
1. An automatic or manual underground irrigation system (conventional spray, bubblers, drip, emitters, drip tubing, porous pipe and the like with turf zones separated from planting zones unless otherwise approved;
2. A hose attachment within 100 feet of all required landscape areas and plant materials where there is no road or parking pavement between the hose attachment and landscape area and the site plan area is not larger than 0.5 acre; or
3. This irrigation methods used shall:
   1. Provide a moisture level in an amount and frequency adequate to sustain growth of the plant materials on a permanent basis;
   2. Be in place and operational at the time of the landscape inspection unless an alternative method is approved under Section 25-2-1008 of the LDC;
   3. Be maintained and kept operational at all times to provide for efficient water distribution.
   4. No irrigation is required for undisturbed natural areas or undisturbed existing trees.

C. Automatic irrigation systems shall comply with the following guidelines:
1. Provide a moisture level in an amount and frequency adequate to sustain growth of the plant materials on a permanent basis.
2. Be in place and operational at the time of final landscape inspection.
3. Be maintained and kept operational at all times to provide for efficient water distribution.
4. Requirements for an automatic irrigation system are:
   a. Adjustable flow controls shall be required on circuit remote control valves and pressure regulation component(s) shall be required where static pressure exceeds manufacturer's recommended operating range.
   b. Valve and circuits shall be separated based on water use, so that turf areas can be watered separately from shrub and ground cover areas.
   c. Sprinkler heads shall have matched precipitation rates within each control valve circuit.
   d. Serviceable check valves shall be required where elevation differential may cause low head drainage, adjacent to paving areas.
   e. Sprinkler head spacing shall be installed for head-to-head coverage or heads shall be spaced as per manufacturer's recommendations and adjusted for prevailing winds. The system shall be designed for minimum run-off and minimum overspray onto non-irrigated areas, (i.e. paving and structures).
   f. All automatic irrigation systems shall be equipped with a controller capable of dual or multiple programming. Controllers shall have multiple cycle start capacity and a flexible calendar program, including the capability of being set to water every five days. All automatic irrigation systems shall be equipped with a rain sensor shut-off device.
   g. Irrigation construction plans shall include a water budget. A laminated copy of the water budget shall be permanently installed inside the irrigation controller door. Water budget shall include:
      * Estimated monthly water use (in gallons per application) and the area (in square feet) irrigated.
      * Chart containing zone number, precipitation rate and gpm.
      * Monthly irrigation schedule for the plant establishment period (first three months) and recommended yearly watering schedule, including seasonal adjustments.
      * Location of emergency irrigation system shut-off valve.
      * To schedule a free City of Austin irrigation audit, call 974-3942.

RECLAIMED WATER SYSTEM TESTING AND INSPECTIONS PROCEDURES:

1. The department of Watershed Protection Development Review – Building inspections shall inspect the reclaimed water irrigation system, including but not limited to inspection of protective sleeving near potable water lines and fire hydrants, color of pipe, and pressure testing.
2. A Customer Service inspection with cross-connection testing is required by TCEQ Chapter 290. This inspection shall be performed by a restricted water system inspector registered with the Austin Water Utility, Special Services Division. The inspection must be performed before connection to an auxiliary water source can be made (before a reclaimed water meter will be set).

Refer to "Contractor's Check List" for installation, testing, and inspections procedures, available through the City of Austin Special Services Division/ Industrial Waste Control and Cross Connection Control at 512.972.1060 or <http://www.ci.austin.tx.us/water/specialservices.htm>.

NON-POTABLE RECLAIMED IRRIGATION WATER:

All irrigation equipment shall comply with all State and Local codes for reclaimed water distribution.
All irrigation mainline and lateral lines shall be Non-Potable purple Class 200 PVC pipe.
All sprinkler heads and valve box lids shall have the Non-Potable water cover.
All Hunter electric valves shall have the #561205 and #512005 reclaimed water identification handle.
Any irrigation equipment spray painted purple shall be Pantone purple 512.
Pop-up spray heads and rotary heads cannot be installed closer than 4'6 radius to any public access potable water source.

IRRIGATION NOTES – 2

The irrigation design does not provide full 100% coverage of the site.
See plans and specifications for areas to be irrigated.
The irrigation contractor is required by law to notify one of the following Texas One Call 800-245-4545
DigTess 1-800-344-8377
Lone Star Notification Center 1-800-669-8344
2 working days prior to any excavation.
The drawings are generally diagrammatic and represent the intent of the work to be installed. For clarity purposes some irrigation lines are shown in hardscape areas without access sleeves. These line shall be installed in a common trench or at the back of curb in landscape areas.
All work called for on the drawings by notes or details shall be furnished and installed whether or not specifically mentioned in the specifications.
The Contractor shall verify on-site pressure is not less than design pressure. Contractor shall submit letter certifying that on site pressure exceeds design pressure by 10%. If on-site pressure does not exceed design pressure by 10%, contact the Owner's representative for resolution. If construction work is started prior to receiving certification letter, the Contractor assumes all costs for changes required to meet on-site pressure.
Heads near fire hydrants are to be installed a minimum of 2' away from the fire hydrant. Heads are to be adjusted so that there is no water sprayed on the fire hydrant.

MUELLER

LOT 1B BLOCK 3 BUYER STREETSCAPE OBLIGATIONS - IRRIGATION

MUELLER

SUBJECT TO CHANGE

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